LIPOMA OF THE FILUM TERMINALE.[1]

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Tumors of the filum terminale are, as a rule, small, as the structure from which they grow is a narrow band composed chiefly of the tissue forming the continuation of the pia. When these growths attain large size they involve the lower lumbar and sacral roots forming the cauda equina, and we speak of them then as tumors of the cauda equina, though it by no means follows that every tumor of the cauda equina originates in the filum. Tumors of the filum terminale are exceedingly rare, and without doubt are occasionally overlooked. The filum is enveloped in a thick mass of anterior and posterior root fibers, and is seen only when these fibers are separated. This examination is not usually made, and malformations of the filum are not likely to be detected unless special attention is directed to this portion of the cord.

A little more than three years ago, while in the laboratory of Dr. Dejerine, I studied the structure of the conus medullaris in quite a large number of cases of tabes dorsalis, and in the spinal cord of one of these cases a tumor of the filum was found, about half a centimeter below the union of the filum with the conus. The tumor formed a distinct uniform swelling of the filum (Fig. 1), and in transverse section was considerably larger than the smallest transverse section of the conus showing the formation of the spinal cord in central gray and peripheral white matter. The interesting specimens have been in my possession nearly four years, but have never been reported. I am indebted to Dr. Dejerine for the material, and for the permission to publish the findings.

The case was one of tabes dorsalis, and the tabetic degeneration of the posterior roots and posterior columns is independent of the tumor of the filum. Even in low sacral sections the posterior columns are distinctly degenerated.

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[1] From the Saltpêtrière, Paris (laboratory of Dr. Dejerine), and the William Pepper Laboratory of Clinical Medicine.

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The tumor is a lipoma. On one side of the growth the structure of the filum may be distinctly seen. Within the filum is a mass of glear cells which represent the termination of the cell-masses surrounding the central canal of the cord; and about these cells the connective tissue of the pia is found. These cells lie in a granular and somewhat fibrillar matrix. On three sides of the filum, and yet forming an integral part of it, is loose connective tissue resembling fatty tissue. The tumor has not a distinct unbroken capsule, but along its edge in many parts the tissue is thickened by fibrous bands. Nerve fibers, stained black by the Weigert-Pal hematoxylin method, are found in small groups here and there within the fatty tissue of the tumor, and probably represent the delicate nerve fibers that may be separated from the periphery of the filum in many normal cases. These nerve bundles, as well as the vessels, are surrounded by fibrous tissue and form small masses of fibrous tissue within the fatty tumor. The pia of the filum is infiltrated in its outer layers by fat cells (Fig. II.) and a few fat cells are seen within the inner layers of the pia, but no fat cells are found

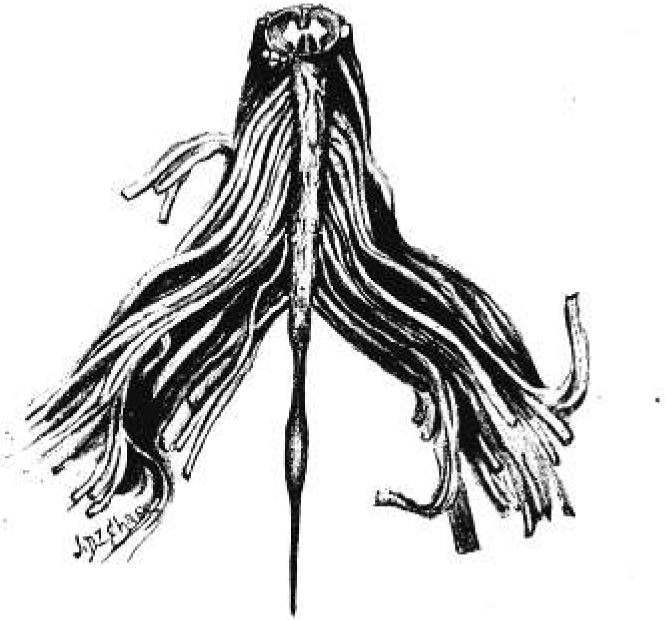

FIG. I. Lipoma of the filum terminale. The drawing has been made from memory. The width of the tumor is exactly that of the microscopical section. Inaccuracies, if they exist, are very unimportant.

interior to the pial sheath. The fat cells of the tumor are round or oval, such as are usually seen in adipose tissue. In the delicate fibrillar structure between the fat cells numerous oval or round nuclei are found—round probably because they are cut transversely. The walls of the small blood vessels within the tumor are not noticeably thickened. At one part of the periphery of the tumor is a nerve bundle containing a number of nerve cells similar to those of spinal ganglia (Fig. III.). Müller[2] has recently described these cells in the lower roots of the cauda equina, within the dura, and not forming a part of any spinal ganglion.

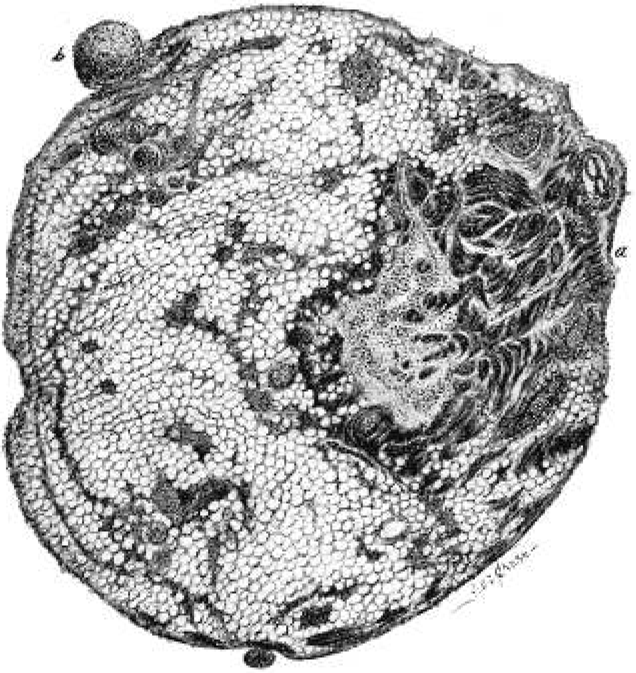

FIG. II. Transverse section of the lipoma. The filum is seen at *a* and is surrounded on three sides by the adipose tissue.

Argutinsky[3] describes the enlargement of the central canal in the conus of the newborn child and human fetus. The description of this enlargement, known as the ventriculus terminalis, is most interesting and suggestive in regard to the etiology of syringomyelia. Argutinsky thinks that the ventriculus terminalis is not a persisting embryonal central canal, but is the result of proliferation of the ventricular wall. In this he differs from all other writers. The subject does not concern us at this time, intensely interesting though it may be, but the statement that a very considerable accumulation of nuclei exists in the wall of the ventricle throughout its length is doubtless the explanation for the accumulation of nuclei we find in the filum terminale.

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[2] Müller, Deutsche Zeitschrift für Nervenheilkunde, Vol. XIV, p. 1.

[3] Argutinsky, Archiv für mikroskopische Anatomie und Entwicklungsgeschichte, Vol. LII, No. 3, p. 501.

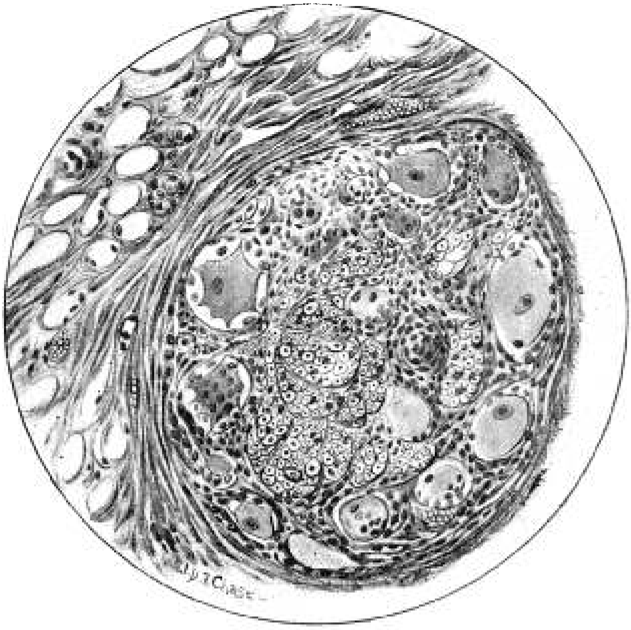

FIG. III. Section of a nerve root (represented at *b* in Fig. II) containing nerve cells of the form of those within the spinal ganglia.

Lipoma of the central nervous system, especially the intradural variety, is one of the rarest of tumors. It has been observed a number of times in cases of spina bifida. Chiari[4], for example, reported a case of spina bifida with lipoma involving the spinal membranes. In 1886 v. Recklinghausen[5] reported a similar case with a myofibrolipoma surrounding the cord; the fatty mass was also found within the spinal dura. Bruns[6], in his work on tumors of the nervous system, says that lipomata are not so rare in the lower thoracic and upper lumbar regions in association with spina bifida in children, and he reports a case of this kind. Ziegler[7] and others make similar statements.

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[4] Chiari, Prager med. Wochenschrift, No. 50, 1884, p. 489.

[5] v. Recklinghausen, Virchow's Archives, 105, 1886, p. 243.

We can hardly be surprised that lipomata should have been observed when the lower part of the spinal column is congenitally deficient.

When we examine the literature for cases of intravertebral lipoma we find little to reward our search. Lipoma is rare within the cranial membranes, as well as within the vertebral. Ziegler, in his last edition, is contented with the statement that fibromata, lipomata and osteomata of the central nervous system are rare (l. c. p. 365). He makes no reference to the occurrence of lipomata within the spinal cord. In mentioning the tumors of the spinal meninges he puts lipomata last (l. c. pp. 308, 312).

Reisman[8] exhibited before the Path. Soc. of Philadelphia a fibrolipoma of the infundibulum.

Oppenheim[9], in his book on cerebral tumors published in 1897, says little is to be found in the literature concerning lipomata of the brain. In rare cases they have been found in the corpus callosum, in the corpora quadrigemina, within the ventricles, in the hypophysis, and a few other places.

The cases of lipomata within the vertebral column are so rare that I have made as thorough an examination as possible of the literature from the references I have been able to obtain. Schlesinger[10] mentions probably all the cases reported, and, with three exceptions, I have been able to find and read all the original papers quoted by him. The journal in which one of these three cases appears is not correctly cited.

The earliest recorded cases are those of Chapelle and Albers.

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[6] Bruns, Die Geschwülste des Nervensystems.

[7] Ziegler, Lehrbuch der speciellen pathologischen Anatomie, Ninth edition, Vol. II.

[8] Riesman, Proceedings of the Path. Soc. of Philadelphia, Vol. I, No. 3, N. S., p. 64.

[9] Oppenheim, Die Geschwülste des Gehirns. 1897. p. 14

[10] Schlesinger, Beiträge zur Klinik der Rückenmarks und Wirbeltumoren.

In Chapelle's[11] case (1847) the spinal dura in a child of four years was surrounded by a large amount of fat from the cervical region to the end of the cord, especially on the posterior aspect. It was an extradural growth.

In the atlas by Albers[12], published also in 1847, the picture of a spinal cord is given with several lipomata on the outer side of the dura.

Obré,[13] in 1852, reported a case in which a deposit of fat was found external to the theca, and between it and the bodies of the last cervical and first thoracic vertebra. It was a mass of fatty tissue, two and a half inches in length, the breadth of the canal and about half an inch in thickness, composed of the ordinary spherical fat cells. It did not differ from fat usually met with in other situations, excepting that the cells seemed to contain fat in a more solid and granular state. This deposit of fat pressed upon the cord.

In 1857 Athol Johnson[14] reported a case in which a fatty tumor was found external to the spinal column and penetrating through an aperture large enough to admit the end of the finger in the posterior wall of the sacral canal. The tumor was dissected from the spinal membranes without any opening in the latter having been made.

Virchow[15], in the same year, reported a case of multiple fatty tumors. One was found in the anterior cerebral fossa loosely connected with the arachnoid; another was found within the vertebral canal in the lumbar region, external to the dura. Virchow regarded this form of tumor as a peculiar variety of lipoma, and spoke of it as myxoma lipomatodes.

E. K. Hoffmann[16] reported a case of gliomyxoma of the spinal cord with numerous fatty tumors upon the outer surface of the dura.

The case reported by Gowers[17] in 1875 is the most interesting in connection with my own that I have found. He observed a small fatty tumor attached to the conus medullaris, and apparently springing from the pia. The cord was from a patient who had had tabes dorsalis. The tumor measured half an inch from above down; half an inch from before back, and about three-eighths of an inch from side to side at its thickest part. This tumor contained striated muscular fibers, and was larger than the new growth in my case, for while the length was nearly the same, the transverse diameter of Gowers' tumor was greater. Like Gowers' tumor, mine is crescentic in transverse section, and surrounds one-half of the filum in the same manner as his surrounded the conus medullaris. Many of the nerve roots of the cauda equina were imbedded in Gowers' tumor, and mine contains many of the delicate filaments which lie close to the filum terminale. I did not have the opportunity of examining my tumor before it had been hardened in Müller's fluid, but in microscopical sections it has a very similar appearance to the one described by Gowers, except that the striated muscular fibers are absent.

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[11] Chapelle, Bulletins de la Société Anatomique de Paris, 22, 1847, p. 6.

[12] Albers Atlas der path. Anat. für praktische Aerzte, Henry & Cohen, Bonn, 1847.

[13] Obré, Transactions of the Path. Soc. of London, Vol. III, p. 248.

[14] Johnson, Transactions of the Path. Soc. of London, Vol. VIII, p. 16.

[15] Virchow, Virchow's Archives, XI, p. 281, 1857.

[16] Hoffmann, Zeitschrift für rationelle Medicin, Vol. XXXIV, p. 188.

[17] Gowers, Transactions of the Path. Soc. of London, Vol. XXVII, 1876.

Gowers does not think the tumor in his case was in causal relation to the degeneration of the posterior columns; neither can I hold this opinion in regard to my case, but it is, nevertheless, an interesting fact that the only two lipomata known of the cauda or filum were in tabetic patients.

Braubach[18] reported the finding of a lipoma, 12 cm. long, in the arachnoid. The growth was adherent to the dura in certain parts, and the cord was much compressed.

Turner[19] reported a case in which a lipomatous tumor was found in about the middle of the dorsal region of the cord, was about the size of a large filbert nut, and formed a well defined fusiform expansion of the substance of the cord at the affected part. The tumor was free from attachment to the external membranes of the cord, and the outer layer of pia sheathing it stripped off easily from a portion of it removed for microscopical examination. A transverse section of the tumor showed that the left half of it consisted wholly of adipose tissue, the cord appearing to have been pushed to one side. The cord, however, was almost wholly destroyed by infiltration with a growth similar to that of the tumor.

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[18] Braubach, Archiv für Psychiatrie, Vol. XV, p. 489.

[19] Turner, Transactions of the Path Soc. of London, Vol. XXXIX, p. 25.

Turner thought it might be supposed that a lipoma originated in a very obese subject, in the pia ensheathing the cord between the more superficial and the deep layers; that the mass compressed the cord, and that an infiltrating fibrous connective tissue growth became the seat of fatty infiltration. It seemed to him more probable that the growth, though having the appearance of a simple lipomatous tumor and consisting almost entirely of adipose tissue, was essentially of a sarcomatous nature, a lipomatous sarcoma or fibrosarcoma, originating in the pia and invading the cord. He seems to have been influenced in expressing the latter opinion by the extreme rarity of lipoma within the cord substance.

Temoin's[20] case was one of tumor in the lumbo-sacral region resembling spina bifida. The lipoma was connected with the tissues within the vertebral column by a pedicle.

Oustaniol[21], in his thesis on tumors of the spinal membranes published in 1892, could find only five cases of lipoma of these membranes reported in the literature. These cases are cited in my paper.

Chipault refers to a case reported by Zavaleta and Masi[22], in which a lipoma was found in the lumbar region and was connected by a pedicle with the arachnoid.

M. Allen Starr[23] reported a case in which a soft fatty tumor was found beneath the tenth thoracic vertebra; it extended across the posterior surface of the dura about half an inch from side to side, and was three-fourths of an inch in length. A second fatty tumor was found beneath the laminae of the eleventh thoracic vertebra.

The original reports of the cases of Holmes[24] (reference given by Schlesinger incorrect), Berenbruch[25] and Stümpell[26]

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[20] Témoin, Archives provinciales de Chirurgie, Vol. I, No. 2, 1892, p. 179.

[21] Oustaniol, Contribution a l'étude des tumeurs des méninges rachidiennes, Paris, 1892, cited by Témoin.

[22] Zavaleta and Masi, cited in Études de chirurgie médullaire, par A. Chipault, 1894, p. 346.

[23] Starr, The American Journal of the Medical Sciences, Vol. CIX, 1895, p. 622.

[24] Holmes, cited by Schlesinger.

[25] Berenbruch, cited by Schlesinger.

[26] Strümpell, cited by Schlesinger.

I have not been able to obtain. Schlesinger says that Holmes' tumor was extradural; Berenbruch's case was one of multiple angiolipomata combined with an angioma of the spinal cord; Strümpell's was an intradural lipoma, but its location is not mentioned by Schlesinger.

These are the only cases of intradural or extradural spinal lipomata mentioned by Schlesinger, and the only ones to which I have been able to obtain references. Some cases may possibly have been overlooked and if so they have been overlooked also by all the writers to whom I have referred.

We find that from 1847 until 1899, a period of 52 years, only 16 cases of intradural and extradural spinal lipomata without association with spina bifida, have been reported as occurring in man. Of these eleven were extradural (Chapelle, Albers, Obré, A. Johnson, Virchow, Témoin, E. K. Hoffmann, Zavaleta and Masi—tumor connected by pedicle with arachnoid—Starr, Holmes, Berenbruch), although one of these (Berenbruch) possibly has not been correctly placed, as I have not been able to obtain the original paper. Four of the sixteen (Gowers, Braubach, Stümpell, Spiller) were intradural, but not in the cord substance; and of these four only one was in the conus (Gowers) and only one in the filum (Spiller), unless Strümpell's tumor was situated in this region. One of the sixteen cases was a lipoma of the cord substance (Turner).

The large number of extradural in comparison with the intradural lipomata may probably be explained by the presence of the fat normally existing between the dura and the vertebrae.

While the tumor of the filum terminale in my case was too small to cause any symptoms, the possibility of increased growth existed. A glioma of the filum, considerably larger than my tumor, causing isolated compression of the nerves of the bladder, was reported by Lachmann[27]. The diagnosis of vesical carcinoma was made, but the necropsy showed that the symptoms were due to paralysis of the vesical nerves and the systemic disturbance resulting from this paralysis.

As a contrast to this large glioma of the filum, Schlesinger (l. c.) reports a glioma in this location the size of a millet seed.

Although such tumors are exceedingly rare, it is well to bear in mind that isolated paralysis of the nerves innervating the bladder may be due to a tumor of the filum. These nerves arise low in the sacral region of the cord, and, therefore, occupy a central position within the cauda equina, and are in close proximity to the filum. Enlargement of the filum may cause pressure first of all on the vesical, and possibly the genital nerves, and lead to symptoms of vesical paralysis and loss of sexual power without disturbance of motion or sensation in the lower limbs, even to the mistaken diagnosis of carcinoma of the bladder, as in Lachmann's case.

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[27] Lachmann, Archiv für Psychiatrie, Vol. XIII, 1882, p. 50.

85. UEBER DEN FASERVERLAUF EINZELNER LUMBAL-UND SACRALWURZELN IM HINTERSTRANG (Concerning the Course in the Posterior Columns of Individual Lumbar and Sacral Roots). Karl Schaffer (Monatsschrift für Psychiatrie und Neurologie, 5, 1899, Nos. 1 and 2, pp. 22, 95).

Schaffer reports three interesting cases in which he was able to study the course of individual posterior roots. In the first case the fifth lumbar root in man was degenerated; in the second the last lumbar root in a cat was completely degenerated and the upper sacral roots partially degenerated, and in the third the coccygeal and the fifth sacral roots in man were degenerated. He compares his findings with those published some years ago by C. Mayer. Schaffer believes that the descending branches of the cervical posterior roots occupy the most lateral portion, and those of the lumbar roots the most median portion of the posterior columns. The comma zones in the posterior columns, according to his views, consist of endogenous fibers, but they contain also some of the descending posterior root fibers. In his first case, the fifth anterior lumbar root was degenerated as well as the fifth posterior root, and the degeneration of the former was believed to be secondary to that of the latter. The degeneration of the roots in this first case was due to increased pressure of the cerebro-spinal fluid and to toxic and nutritive conditions produced by a tumor pressing upon the upper part of the thoracic cord. The degeneration in the second case was the result of pachymeningitis, and the case seemed to show that the intramedullary portion of the posterior roots is less resistant than the extramedullary portion. In the third case the dorsomedial sacral bundle was not degenerated, and Schaffer thinks that his case proves that the fibers in this bundle are endogenous, and that the coccygeal and sacral nerves have no part in the formation of the triangular zone. [The study of this case was not made with the Marchi method. Schaffer speaks in this paper of the superiority of the Marchi method over that of Pal, and it is certainly not necessary to remind so skilled a neuropathologist that the Marchi method often reveals a considerable degeneration where the Pal gives little indication of such alteration. The correctness of his statement: "Somit haben die Steiss und Kreuznerven mit dem dorsomedialen Sacralbündel nichts zu thun," seems unproven.] SPILLER.